

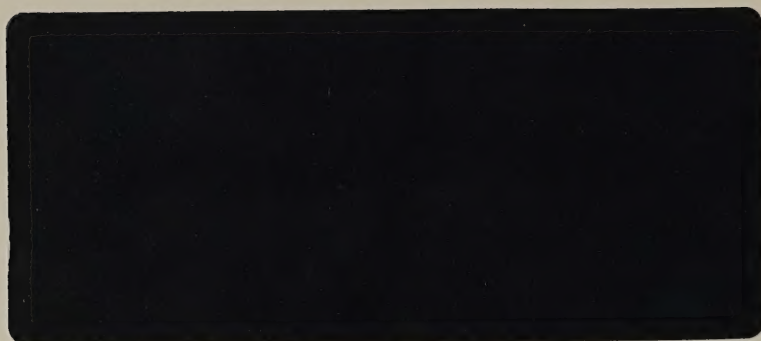
**LANDFILL METHANE MONITORING PLAN
FOR
THE UNIFIED DISPOSAL DISTRICT LANDFILL**



DAMSCHEN & ASSOCIATES, INC.

CONSULTING ENGINEERS

• HELENA, MONTANA •



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May 4, 1994

Mr. Pat Crowley
Montana Solid and Hazardous Waste Bureau
Capitol Building
Helena, Montana

**LANDFILL METHANE MONITORING PLAN
FOR
THE UNIFIED DISPOSAL DISTRICT LANDFILL**

Dear Mr. Crowley:

On behalf of the Unified Disposal District, we are pleased to submit this Methane Monitoring Plan for the Alaska landfill. We intend to implement this plan at the facility beginning on May 12, 1994 in conjunction with our work in Montana. Therefore, your timely review would be appreciated so that we can proceed with these and drilling contracts with specific regarding waste and methane.

Prepared for:

THE UNIFIED DISPOSAL DISTRICT MONTANA

Sincerely,

DAMSCHEN & ASSOCIATES, INC.

APRIL, 1994

Robert L. Bergman
Project Geologist

RECEIVED

MAY 05 1994

MONTANA DEPARTMENT OF HEALTH
AND ENVIRONMENTAL SCIENCES
SOLID AND HAZARDOUS WASTE DIVISION

Prepared by:

DAMSCHEN & ASSOCIATES, INC.

Helena, Montana



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May 4, 1994

Mr. Pat Crowley
Montana Solid and Hazardous Waste Bureau
Cogswell Building
Helena, Montana 59620

Dear Mr. Crowley:

On behalf of the Unified Disposal District, we are pleased to submit this Methane Monitoring Plan for the Malta landfill. We intend to implement this plan at the facility beginning on May 19, 1994 in conjunction with our work in Malta. Therefore, your timely review would be appreciated so that we can supply our client and drilling contractor with specifics regarding costs and materials.

Sincerely,

DAMSCHEN & ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read 'Bruce L. Siegmund', with a large, sweeping flourish at the end.

Bruce L. Siegmund
Project Hydrogeologist

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INTRODUCTION

Purpose and Scope

This document is a Methane Monitoring Plan intended to bring the Unified Disposal district landfill into compliance with newly-adopted solid waste management regulations regarding the monitoring of landfill gases. The document will briefly describe the existing conditions at the landfill and propose a plan for the installation and monitoring of the site for methane gas.

The monitoring plan requires a response and proposal for the monitoring of methane on the property and within structures at solid waste disposal facilities in accordance with ARM 16.14.521(1)(f), which states that methane concentrations may not exceed 25 percent of the lower explosive limit (LEL) in structures and that methane at the facility property boundary not exceed the lower explosive limit.

Location

The landfill is located approximately seven miles east of Havre, Montana in Section 1 of T32N, R17E and Section 6 of T32N, R18E. It lies on a bluff along the breaks of the Milk River at an average elevation of 2,500 feet above mean sea level datum (MSL).

Previous Work

Several investigations of the area have been undertaken by Damschen & Associates, Inc. (1991; 1993;) regarding the characterization of the site. It is recommended that the reader have all of these documents at hand for reference along, with the engineer's site plans.

Geology and Hydrology

The site is underlain by fine-grained sand, silt and clay of the Cretaceous-aged Judith River formation, Pleistocene-aged glacial deposits, and Holocene-aged alluvium. The geology is discussed in detail in both previous reports (Damschen & Associates, Inc., 1991, 1993). In general, the highlands in the area are covered with a mantle of glacial drift, the breaks along the Milk River consist of exposures of the Judith River formation, and the low-lying areas are underlain by alluvium.

Ground water at the site is found at several elevations perched within sand beds of the Judith River formation. The uppermost aquifers are variable in character, hosted by one or more strata of fine sand, and are generally confined. These aquifers have no resource value because of low productivity and overall water quality, however they yield sufficient water to

wells to accommodate the requirements for collecting small samples for monitoring purposes. The depth to water-bearing strata ranges from about 30 feet to over 100 feet, with little documented communication between the aquifers.

The object of this proposal is to present evidence of potential landfill gas migration pathways and a methodology for intercepting any gas that might be produced. Therefore, the geological environment becomes the dominant factor at this site. The glacial drift tends to be quite variable in character, ranging from silt- and clay-rich drift to coarse gravel. The silty clay and clayey silt strata within the Judith River formation will act as barriers to vertical gas migration, as will some of the finer-grained portions of the alluvial deposits. Therefore, the logical target for landfill gas monitoring is the permeable sand beds of the glacial drift and the Judith River formation.

Monitoring wells will be installed in the area shown on Figure 1. These probes will be installed in a staggered pattern, depending upon the depth at which sand beds are encountered. The precise depth at which these probes will be screened cannot be precisely determined at this point in time because of the unpredictable nature of the occurrence of sand bodies within the Judith River formation. Each probe also will have a screened interval at or near the known elevation of known sand deposition (approximately 2,545 feet MSL, 345 on Page 1), another screened interval about the center of the drilled interval, and a third one about 20 feet from the ground surface. Again, this scheme will have to be varied with the elevation and thickness of the sand beds encountered.

Structures

There are no on-site surface structures such as ditches, pipelines or underground utility lines at the landfill that will require sampling for landfill gases. No surface structures, such as offices or shops, are scheduled for construction at the United Disposal District landfill. If any such structures are built at the facility, the Airborne Monitoring Plan will be amended as necessary.

Monitoring Probe Construction

Each of the monitoring probes will be 1.25 inches in diameter, perforated with 4-inch drill holes at 6-inch intervals along the probe, staggered with gravel pack around the screened interval, and finished in a manner that will prevent downward migration of surface waters. The wells will be equipped with a slotted Tygon tube for a sampling port and be protected by a locking steel cap. Multiple installations will be advanced in the same manner, with the annular space between screened intervals sealed with hydrated bentonite. The entire above-ground assembly will be visually inspected during every scheduled sampling event for damage to or failure of any components.

PROPOSED METHANE MONITORING PLAN

Monitoring Targets

The logical targets for methane monitoring at this site are the sand and gravel beds within the glacial drift and the sand bodies within the Judith River formation. Currently, one ground-water monitoring well that failed to encounter water in glacial drift (MW-7 on Plate 1) is screened in such a manner that it will serve well as a methane monitoring probe. There is also 1.25-inch-diameter piezometer (P-4 on Plate 1) that failed to encounter water in the drift that will serve well as a methane probe.

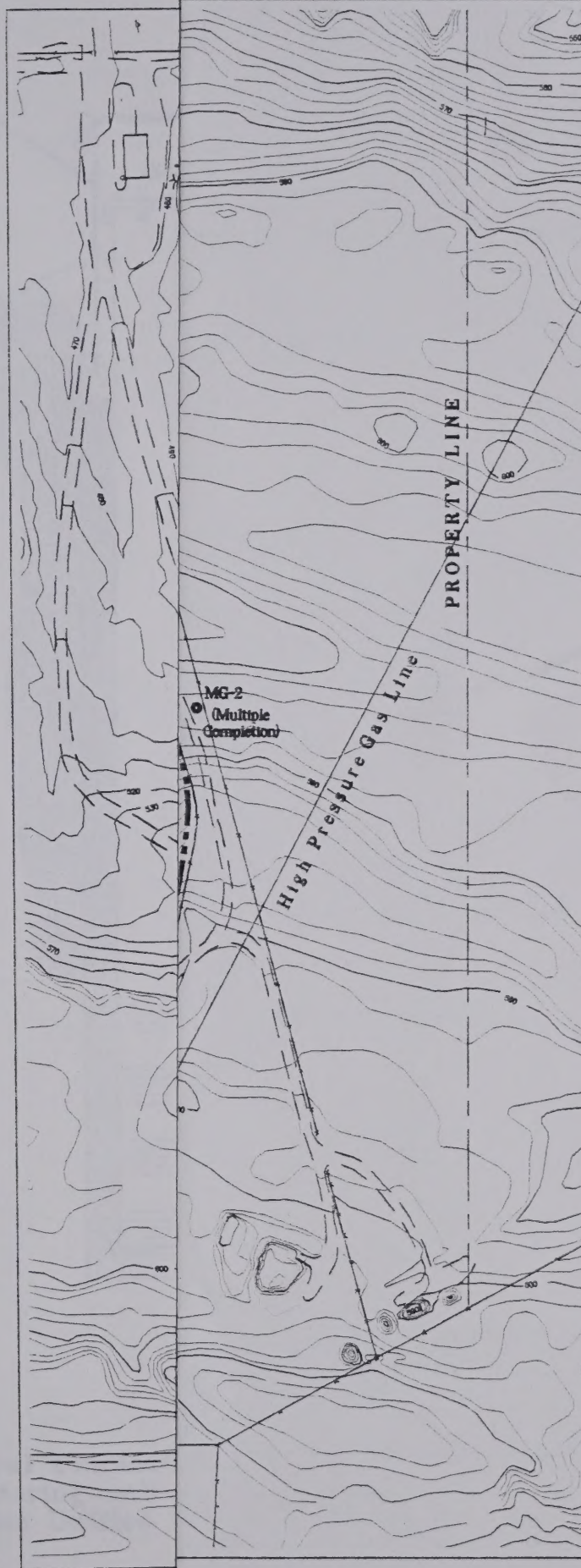
Additional probes will be installed at the locations noted on Plate 1. These probes will be double or triple installations, depending upon the depth at which sand bodies are encountered. The precise depth at which these probes will be screened cannot be precisely determined at this point in time because of the unpredictable nature of the occurrence of sand bodies within the Judith River formation. Each probe site will have a screened interval at or near the lowest elevation of known waste deposition (approximately 2,545 feet MSL; 545 on Plate 1), another screened interval near the center of the drilled interval, and a third no closer than 10 feet from the ground surface. Again, this scheme will have to be varied with the elevation and thickness of the sand beds encountered.

Structures

There are no sub-surface structures such as drains, pipelines or underground utility lines at the landfill that will require sampling for landfill gases. No surface structures, such as offices or shops, are scheduled for construction at the Unified Disposal District landfill. If any such structures are built at the facility, the Methane Monitoring Plan will be amended as necessary.

Monitoring Probe Construction

All of the methane probes will be 1.25 inches in diameter, perforated with ¼-inch drill holes or 0.025-inch hand-cut slots, completed with gravel pack around the screened interval, and finished in a manner that will prevent downward migration of surface waters. The wells will be equipped with a clamped Tygon tube for a sampling port and be protected by a locking steel cover. Multiple installations will be screened in the same manner, with the annular space between screened intervals sealed with hydrated bentonite. The entire above-ground assembly will be visually inspected during every scheduled sampling event for damage to or failure of any components.



KEY

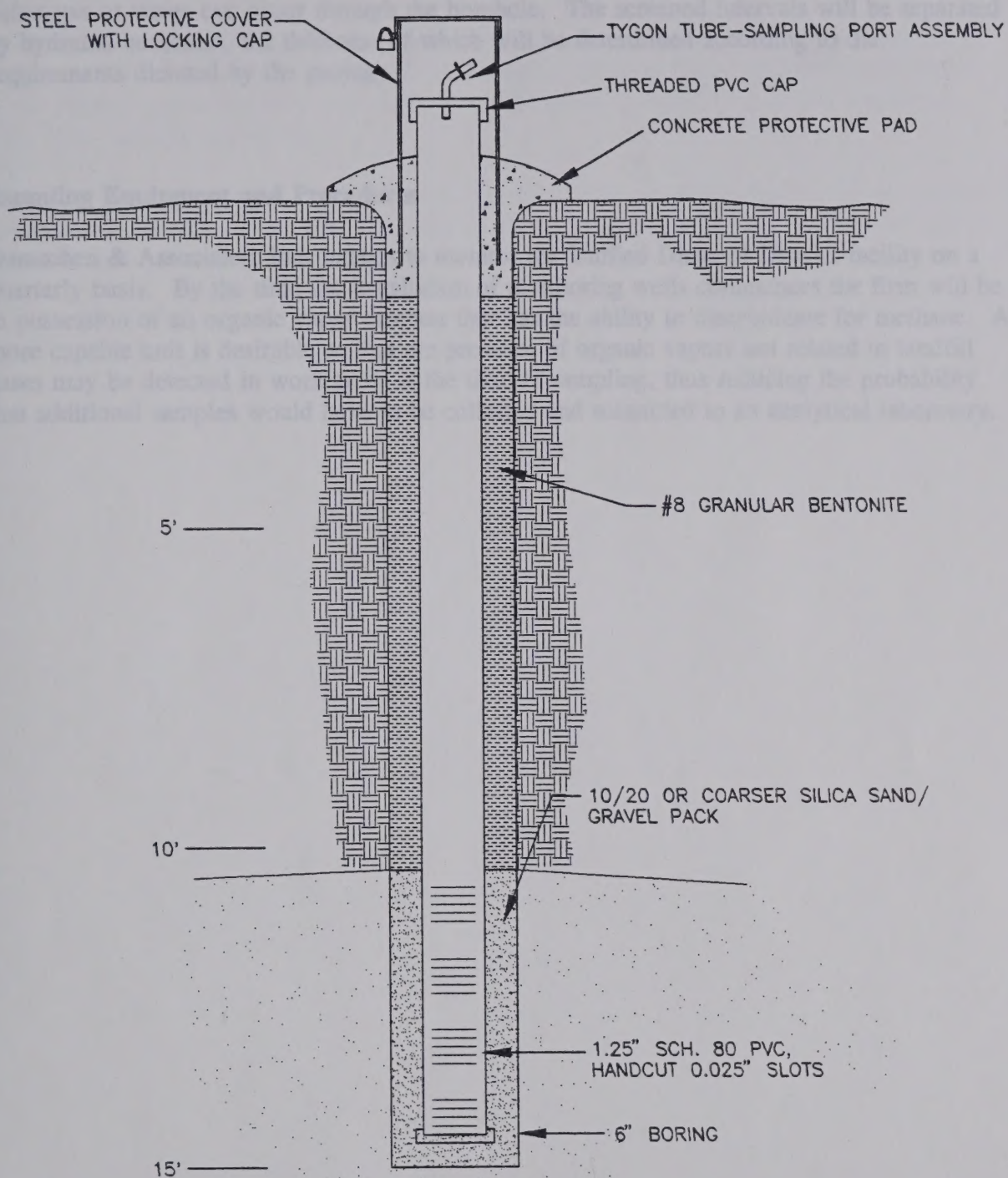
- PROPOSED LOCATION OF METHANE MONITORING WELL

D Damschen & Associates, Inc.
CONSULTING ENGINEERS
2030 11TH AVE. SUITE 110
SHELBY, MONTANA

JOB/ACCD. NUMBER
2138140
DRAWN BY
D. MCMALEY
CHECKED BY
D. MCMALEY
DATE
FEBRUARY, 1992

PROJECT TITLE
Figure 1. Site map of the Unified Disposal District landfill showing proposed methane monitoring locations.





NOTE: Drawing not to scale

Figure 2. General schematic diagram of methane monitoring well construction proposed for the Unified Disposal District landfill.

Multiple installations shall be constructed in such a manner as to ensure that no migration of either gas or water can occur through the borehole. The screened intervals will be separated by hydrated bentonite, the thickness of which will be determined according to the requirements dictated by the geology.

Sampling Equipment and Procedures

Damschen & Associates, Inc. intends to monitor the Unified Disposal District facility on a quarterly basis. By the time the installation of monitoring wells commences the firm will be in possession of an organic vapor detector that has the ability to discriminate for methane. A more capable unit is desirable so that the presence of organic vapors not related to landfill gases may be detected in work areas at the time of sampling, thus reducing the probability that additional samples would have to be collected and submitted to an analytical laboratory.

CONCLUSION

The Unified Disposal District landfill is sited within three distinct geological formations, of which only the Cretaceous-aged Judith River formation presents likely methane monitoring targets. These targets comprise unconsolidated sand strata bounded by resistant sandstone and/or clay- and silt-rich strata.

The facility will be monitored quarterly with a methane-discriminating device. Tygon ports at wells will be evacuated with a hand pump to ensure that appropriate air samples are taken. All results will be reported according to current Montana regulatory requirements.

REFERENCES

- Damschen & Associates, Inc., 1991, Hydrogeologic and soils analysis for the existing sanitary landfill: unpublished report to the Montana Solid and Hazardous Waste Bureau, prepared for the Unified Disposal District at Havre, Montana.
- Damschen & Associates, Inc., 1993, Additional hydrogeological and soils analysis for the Unified Disposal District, Havre, Montana: unpublished report to the Montana Solid and Hazardous Waste Bureau, prepared for the Unified Disposal District at Havre, Montana.
- State of Montana, 1993, Amended Rules of Montana 16.14, sub-chapter 5.
- Bilgri, T. A., 1993, Landfill gas production and management: SWANA landfill ground water and methane monitoring school, Great Falls, Montana, December 1-2, 1993.

